MICHIGAN DEPARTMENT OF COMMUNITY HEALTH
EPIDEMIOLOGY OF STROKE FACT SHEET
NOVEMBER, 1998

STROKE IN MICHIGAN

MORTALITY
In 1996, stroke was the third most common cause of death in Michigan and a major cause of hospitalization and disability. Twenty percent of stroke victims don't survive, and 55% of stroke survivors have a disability. In 1996, stroke was responsible for 5,718 or 6.9% of all deaths. Figure 1 displays the number of stroke deaths by age, race and gender. One in eight stroke deaths occurred in individuals under age 65, and 50% of stroke deaths occurred in individuals between the ages 65 to 84. Eighty-five percent of those dying from stroke were white and 15% were African-American.

HOSPITALIZATION
In 1996, there were 36,718 hospital admissions for stroke (3.2% of all admissions). Figure 2 displays the number of hospitalizations by age, race and gender. One in four admissions occurred in patients less than 65 years old, and 60% of all admissions occurred in individuals between the ages 65 to 84. Eighty-four percent of those hospitalized were white and 16% were African-American.

GENDER AND RACIAL DIFFERENCES
Although males have a higher risk of dying of stroke than females, the number of females dying of stroke is larger than for males, because women live to older ages when stroke is most common. In 1996, 60% of all stroke victims were women. There are also striking racial and gender differences in the average age of hospitalization and death due to stroke:

Average Age of Hospitalization and Death

	White		African-American	
	Male	**Female**	**Male**	**Female**
Hospitalization	70.6	73.7	64.8	67.6
Death	75.6	80.3	66.5	71.5

Figure 1
Number of Stroke Deaths, Michigan, 1996

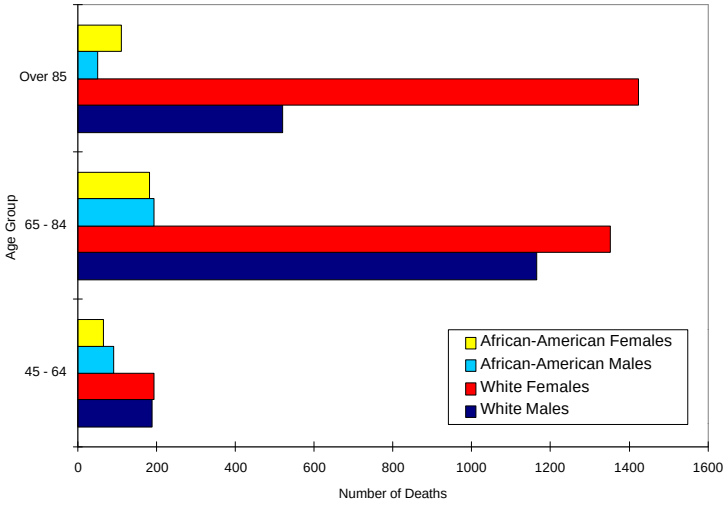
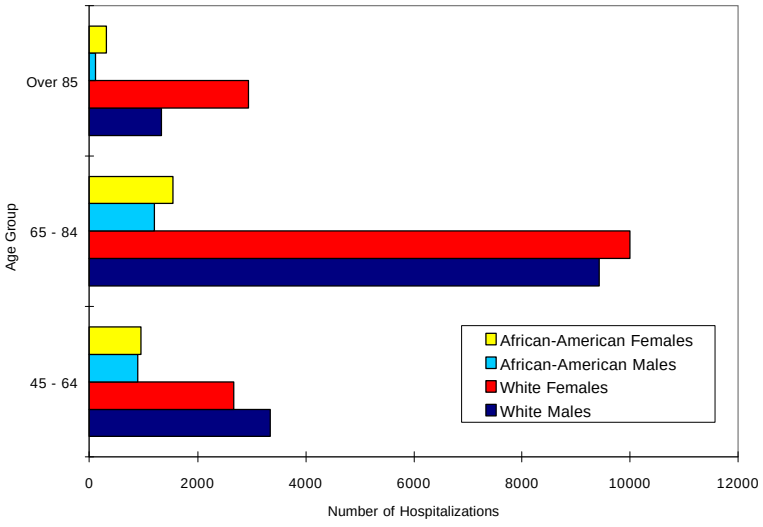


Figure 2
Number of Stroke Hospitalizations, Michigan, 1996



WHAT IS STROKE?[1]
Stroke is a form of cardiovascular disease, which occurs when a blood vessel bringing oxygen to the brain bursts or is clogged by a blood clot. Without oxygen, nerve cells die within minutes, and the part of the body controlled by those cells cannot function. There are two major types of stroke: thrombotic which accounts for 70 - 80% of all strokes and hemorrhagic. Hemorrhagic stroke, caused by ruptured blood vessels, has a much higher fatality rate and tends to occur in younger age groups.

AGE-ADJUSTED MORTALITY

Trends in age-adjusted stroke mortality rates (Figure 3) illustrate the gender and racial differences discussed on the previous page. Stroke mortality rates have declined dramatically throughout the 20th century. For example overall age-adjusted stroke mortality rates declined around 50% between 1980 and 1992. However, after 1992, the decline ended, and race and gender specific age-adjusted stroke mortality rates increased 5.9% per year for African-American males, while rates were stable or increased slightly for white males and females and African-American females.

AGE-SPECIFIC MORTALITY

For the most part, trends in race and gender age-specific mortality rates mirror the pattern in age-adjusted rates, showing steady declines between 1980 and 1992 and then stabilizing or increasing thereafter. The reversal in the decline of stroke mortality has varied by age group, however.

45 - 64 year olds

Figure 4 illustrates the consistent declines in stroke mortality rates for all four race-gender groups between 1980 and 1992. Rates increased for African-American males (6.3%/yr) and white females (0.3%/yr) since 1992. This age group also displays the largest racial disparities in stroke mortality.

65 - 84 year olds

Trends in stroke mortality in this age group are similar to the other age groups. However, the absolute rate of stroke mortality is now much higher (350-500 per 100,000 person years). After 1992, large increases in stroke mortality rates were seen in African-American males (300 to 450 per 100,000) and white males (270 to 295 per 100,000). Increases for African-American females and white females were modest. Racial differences in stroke mortality begin to disappear after age 65.

85 years of age and over

As observed in Figure 5, whites now have higher stroke mortality rates than African-Americans. Again, stroke mortality increased in all race and gender groups after 1992. Stroke death rates are extremely high in this age group. As an example in 1996, rates for white males 85 years and older were 74 times greater than for white males 45-64.

Figure 3
Age-Adjusted Stroke Death Rates by Race and Gender
Michigan, 1980 - 1996

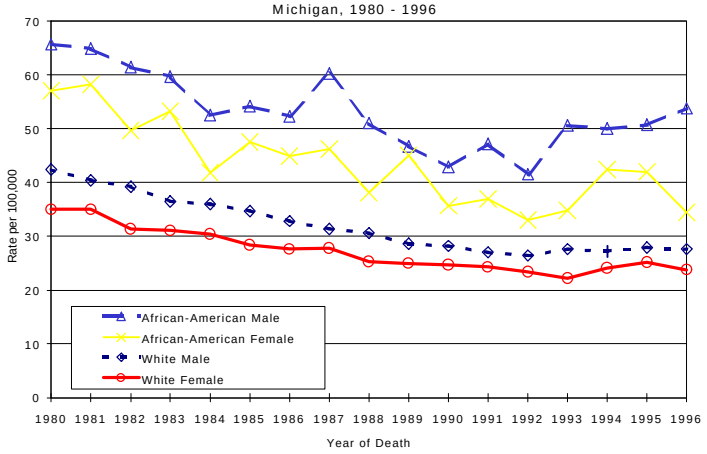


Figure 4
Age-specific Stroke Death Rates, Ages 45 - 64
Michigan, 1980-1996

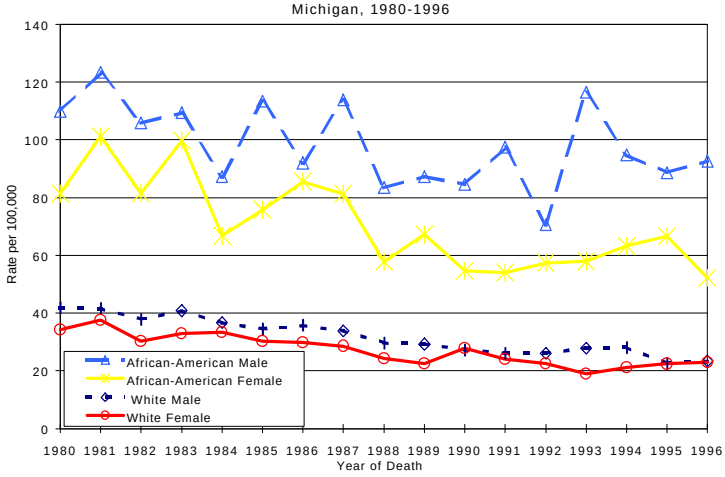
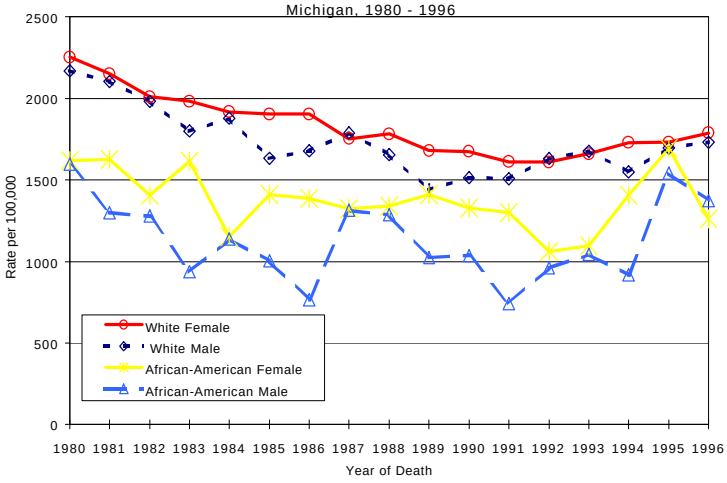


Figure 5
Age-specific Stroke Death Rates, Ages 85 and over
Michigan, 1980 - 1996



Racial Differences in Mortality

African-American males and females have a higher risk of dying from stroke than whites, especially at younger ages. However, over age 85, the risk is higher for whites.

Risk of Stroke Death, Michigan, 1996
African-Americans versus Whites

Age Group	45-64	65-74	74-84	>85
Male	4.0	2.0	1.3	0.8
Female	2.9	1.7	1.0	0.7

Figure 6 illustrates that between 1980 and 1996, the risk of stroke for African-American males compared to white males increased for all ages less than 85. Similar increases were seen among females.

Primary Prevention

Table 1 describes risk factors for stroke. Controlling high blood pressure, high cholesterol, and reducing smoking will have the greatest effects on reducing stroke rates. Other risk factors include age, gender, family history, previous stroke and socioeconomic status. Results of the 1995 Behavioral Risk Factor Survey, shown below, estimated that 84% of the adults in Michigan have at least one risk factor for stroke. Over 50% have two or more risk factors.

Prevalence of Stroke Risk Factors, BRFS, 1995

Risk Factor	Michigan	U.S.	Rank
High Blood Pressure	23.5%	22.0	9
Cigarette Smoking	25.9%	22.4	7
Sedentary Life Style	23.7%	**** *	
Overweight	31.0%	28.7	5
Diabetes	5.4%	4.4	8
High Cholesterol	31.4%	19.4	4

Secondary prevention - Acute Care Treatment

The use of anti-platelet and anticoagulants therapies (e.g. aspirin, coumadine, ticlopidine, etc.) have proven very effective in the secondary prevention of stroke. In addition, carotid stents and endarterectomy are also used to prevent stroke in high risk patients.
Use of thrombolytic therapy (tPA or recombinant tissue plasminogen activator) for treatment of ischemic stroke has great potential for improving survival and decreasing disability.

Figure 6
Risk of Stroke Mortality, African-American versus White Males
Rate Ratios and 95% Confidence Intervals, M ichigan, 1980, 1992 and 1996

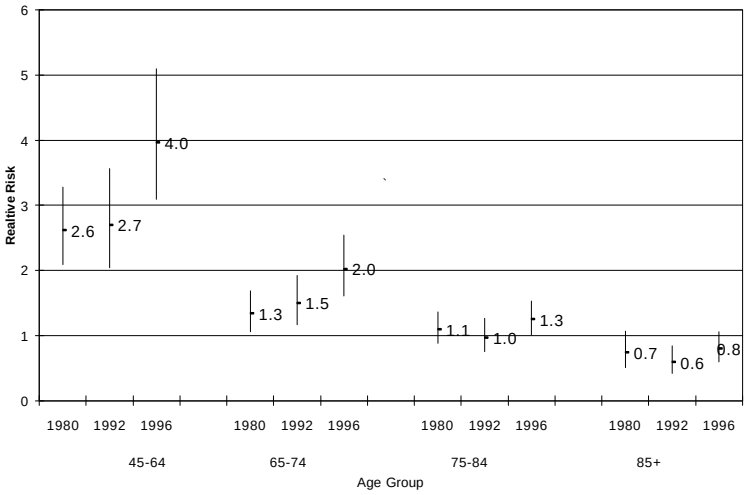


Table 1
Risk Factors for Stroke[2]

Risk Factor	Magnitude of Risk	Attributed Proportion	Range
High Blood Pressure	Strong 4 RR > 4	26%	***
High Cholesterol	Moderate RR 2 - 4	***	0 - 20%
Diabetes		2 %	0 - 7%
Cigarette Smoking		18 %	11-25%
Heart Disease		***	***
Oral Contraceptive Use	Weak RR < 2	***	***
Obesity		***	15-25%
Physical Inactivity	Possible	***	***
Alcohol Use		***	***

Guidelines to Reduce Stroke - National Stroke Association[3]

1. Know your blood pressure; have it checked annually; and keep high blood pressure under control.
2. Find out if you have atrial fibrillation and take the prescribed medications if you do.
3. If you smoke, stop.
4. If you drink alcohol, do so in moderation.
5. Know your cholesterol level; follow your doctor's recommendations to keep high cholesterol under control.
6. If you are diabetic, follow your doctor's recommendations.
7. Include exercise in the activities you enjoy in your daily routine.
8. Enjoy a lower sodium and fat diet.
9. Find out if you have circulation problems and take the prescribed medications if you do.
10. If you experience stroke symptoms, seek immediate medical attention.

RESOURCES

STATE

Michigan Department of Community Health
Cardiovascular Health and Nutrition Section
3423 MLKing, Jr. Blvd. P.O. Box 30195
Lansing, MI 48909
517-335-8374

American Heart Association Michigan Affiliate
16310 West 12 Mile Road P.O. Box 760160
Lathrup Village, MI 48076-0160
248-557-9500 Fax: 248-569-3353
http://www.amhrt.org/affili/MI/index.html

NATIONAL

National Stroke Association
Suite 1, 96 Inverness Drive East
Englewood, CO 80112-5112
1-800-Strokes (1-800-787-6537)
303-649-9299 Fax: 303-649-1328
http://www.stroke.org

American Heart Association
7272 Greenville Ave.
Dallas, TX 75231-4596
1-800-AHA-USA1 241-373-4596
http://www.amhrt.org

NEWSLETTERS

Be Stroke Smart
National Stroke Association
http://www.stroke.org

STROKE INFORMATION

National Institute of Neurological Disorders and Stroke
National Institutes of Health
31 Center Drive, MSC 2540
Building 31, Room 8A06
Bethesda, MD 20892-2524
1-800-352-9424
http://www.ninds.nih.gov

National Heart, Lung and Blood Institute
National Institutes of Health
P.O. Box 30105
Bethesda, MD 20824-0105
301-251-1222
http://www.nhlbi.nih.gov

METHODS

Mortality data were obtained from the 1980-1996 Michigan Resident Death File (MRDF) and hospitalization data were obtained from the 1990-1996 Michigan Inpatient Data Base (MIDB) maintained by the Division of Vital Records and Health Statistics in the Michigan Department of Community Health.
All certificates contained in the MRDF coded as ICD-9-CM codes 430-438 (cerebrovascular disease) as the underlying cause of death were analyzed. The MIDB contains records of each admission for all short-stay acute care facilities in Michigan as well as abstracts for Michigan residents hospitalized in bordering states. Because the MIDB does not contain unique identifiers, multiple admissions for the same individual cannot be detected. To limit potential bias, only cases with a primary diagnosis of ICD-9-CM 430-438 were analyzed.
Population estimates for rate calculations were obtained from the Michigan Office of the State Demographer.
Stroke and hospitalization rates were age-adjusted using the direct method: the U.S. 1940 population was used as the standard. National age-adjusted rates were obtained from the National Center for Health Statistics.
Risk factor estimates were obtained from the 1995 Michigan Behavioral Risk Factor Survey.
Because 1992 appeared to be the point of critical change in the trends in age-adjusted stroke mortality rates, linear regression models were constructed to estimate average annual absolute and percent change for two time periods, 1980-1992 and 1992-1996. Mortality rate ratios and 95% confidence intervals were calculated for age, race and gender groups using STATCALC in EpiInfo 6.04.

1. **Adapted from National Stroke Association:http://www.stroke.org 1998**
2. **Adapted from Brownson RC, Remington PL, Davis JR: Cardiovascular Disease.** *Chronic Disease Epidemiology and Control* **Washington D.C. American Public Health Association. 1993 and Bronner et al.: Primary prevention of stroke** *NEJM* **1995;333(21):1392-1400**
3. **National Stroke Association: NSA releases stroke prevention guidelines. http://www.stroke.org/Newsletters/Current/newsletter.html. April 1998**

For further information about the Stroke Epidemiology Fact Sheet, contact either the Epidemiology Services Division at the Michigan Department of Community Health (517) 335-8806 or the Cardiovascular Health and Nutrition Section (517) 335-8374.